International Journal of Medical and Health Science
ISSN (Online): 2456-6063
Volume 11 Issue 02 November 2025
DOI: https://doi.org/10.53555/zsav1r03

A STUDY ON PREVALENCE AND MAINTENANCE OF HYPERTENSION ON CHRONIC KIDNEY DISEASE PATIENTS UNDERGOING MAINATENANCE HEMODIALYSIS

Tanshila[1] *, Dr. Pankaj Kaul[2] and Mrinmoy Maity[3]

[1]Post-Graduate Student, Department of Dialysis Technology, University School of Allied Health Sciences, Rayat Bahra University Mohali, India.*
[2]Dean, University School of Allied Health Sciences, Rayat Bahra University Mohali, India.
[3]Assistant Professor, Department of Dialysis Technology, University School of Allied Health Sciences, Rayat Bahra University Mohali, India.

Corresponding Author: Tanshila
Post-Graduate Student, Department of Dialysis Technology, University School of Allied Health Sciences, Rayat Bahra University Mohali, India.

Corresponding Author: Tanshila
Email: tanshila1997@gmail.com

ABSTRACT

Background: *Hypertension is a majority comorbidity in chronic kidney disease (CKD) patients undergoing maintenance hemodialysis (MHD), ye it is prevalence, control rates, and optimal management strategies in clinical practices remain inadequately characterized*

Objectives: *the study aimed to determine the prevalence of hypertension, evaluated blood pressure control rates, identify associated factors, and assess the effectiveness of management strategies in CKD patients receiving MHD*

Methods*: In this observational study, 50 CKD patients undergoing MHD were evaluated. Data on demographic characteristics, blood pressure measurements, antihypertensives medications, dietary adherence, and complications were collected through medical record review. Hypertension control was defined as <140/90 mmHg according to JNC 7 guidelines.*

Results: *the prevalence of hypertension was 94% (47/50) with only 25% (12/47) achieving blood pressure control. A significant association was found between uncontrolled hypertension and diabetes mellitus (p=0.03), with 87.2% of patients requiring antihypertensives medications, notably patients adhering to strict sodium restrictions (<2g/day) demonstrated significantly higher control rates (63.2%) compared to non-adherent patients (0%).*

Conclusion: *hypertension is highly prevalent but poorly controlled in CKD patients on MHD. These overall findings emphasize the need for a paradigm shift toward non-pharmacological interventions as foundational therapy to improve hypertension control and reduce complications in this high-risk population.*

Keywords: *chronic kidney disease, hemodialysis, hypertension, blood pressure control, sodium restriction, polypharmacy*

INTRODUCTION

Chronic kidney disease (CKD) affects 10–15% of the population worldwide and its prevalence is increasing (1,2) CKD is defined as presence of reduced kidney function (an estimated glomerular filtration rate [eGFR] < 60mL/ min/1.73 m2 or kidney damage (indicated by the presence of proteinuria) for ≥ 3 months duration

Table 1.1: Summaries the eGFR-based classification of chronic kidney disease (CKD)

Categories	GFR (ml/min/1.73m^2)	Kidney Function
Stage	≥ 90	Loss of Kidney function Normal to mild
Stage II	60-89	Mild Loss of kidney function
Stage IIIa	45-59	Moderate loss of kidney function
Stage IIIb	30-44	Moderate loss of kidney function
Stage IV	15-29	Severe loss of kidney function
Stage V	>15	Kidney failure (ESRD)

Chronic Kidney Disease is often associated with a group of complications including electrolyte imbalances, mineral and bone disorders, anemia, dyslipidemia and Hypertension (HTN). It is well known that chronic kidney disease is a risk factor for cardiovascular disease (CVD). Reduced GFR and albuminuria are independently associated with an increase in cardiovascular and all-cause mortality (3)

Chronic kidney disease is closely associated with increased activity of the Renin-Angiotensin-Aldosterone System (RAAS). There is reduced blood flow in peritubular capillaries downstream of sclerosed Glomeruli. As a result, this reduced effective (perceived) blood flow, Glomeruli in these regions Hyper-secrete Renin, thereby increasing circulating Angiotensin II levels. Angiotensin II has a direct vasoconstrictor effect, which increases systemic vascular resistance and BP. Because there are fewer functioning Glomeruli in Chronic kidney Disease, each remaining Glomerulus must increase its Glomerular filtration rate increasing systemic Arterial pressure helps bolster perfusion pressure and Glomerular Filtration Rate.

Progressive CKD is linked to several complications with higher prevalence and intensity at lower levels of kidney function, which interact with each other (4,5,6)

HYPERTENSION

High Blood Pressure is a common condition in which the long-term force of the blood against artery walls is high enough that it may eventually cause Health problems, such as heart disease. Blood pressure is determined both by the amount of blood the Heart pumps and the amount resistance to blood flow in arteries (7) Hypertension is associated with increased risk of cardiovascular disease (CVD) events (coronary heart disease, heart failure, and stroke) and death.

Automated blood pressure testing methods are becoming more and more important in the diagnosis of hypertension. The primary or secondary kidney's incapacity to eliminate salt at a normal blood pressure is the pathophysiology of essential hypertension. The disorder also involves the major arteries, the microcirculation, the central nervous system, and endocrine variables.

Important factors in the treatment of hypertension include the location and timing of blood pressure checks in connection to the dialysis process itself. Blood pressure is usually taken throughout dialysis (pre dialysis, post dialysis, and intradialytic measurements) and in between dialysis sessions (interdialytic measures) for patients on maintenance haemodialysis.

The first line of treatment for hypertension is changing one's lifestyle, which includes losing weight, eating a nutritious diet that is high in potassium and low in sodium, exercising, and reducing or quitting alcohol. The effectiveness of pharmacologic therapy is increased by the partially additive lowering effects of individual lifestyle factors. The level of blood pressure and the existence of a high atherosclerotic CVD risk should be the basis for the decision to start antihypertensive medication.

Table 1.2: Classification of Hypertension as per JNC Guidelines (8)

Blood Pressure classification	Systolic Blood pressure (mm Hg)	Diastolic Blood pressure (mm Hg)
Normal	<120	<80
Pre hypertension	120-139	80-89
Stage I hypertension	140-159	90-99
Stage II hypertension	≥169	≥100

RELATION BETWEEN HYPERTENSION AND CKD

Hypertension is common in patients with chronic kidney disease (CKD). The prevalence ranges from 60% to 90% depending on the stage of CKD and its cause. The mechanisms of hypertension in CKD include volume overload, sympathetic overactivity, salt retention, endothelial dysfunction, and alterations in hormonal systems that regulate blood

pressure (BP). Hypertension remains a leading attributed cause of end-stage kidney disease (ESKD) in the United States. Un controlled hypertension is also associated with higher risk for cardiovascular (CV) morbidity and mortality. (9)
The relationship between Hypertension and Chronic kidney disease is cyclic in nature. Hypertension and Chronic kidney disease are both independent risk factors for CVD. When both exist together the risks of CVD morbidity and mortality rare substantially increased (10)

Because hypertension can both induce and result from a decline in kidney function, the relationship between blood pr essure and chronic kidney disease (CKD) is more complicated.Blood pressure has been shown to be an independent ri sk factor for renal outcomes in a number of large prospective observational studies in both the general population and treated hypertensive patients; the higher the blood pressure, the higher the risk of CKD and ESKD.(11,16)
Both males and females are affected by bp associated risk of incident CKD which manifest from mild to moderate blood pressure increases(17,18). albumin in the urine significantly increases the negative consequences of high blood pressure on cardiovascular morbidity and mortality in the general population (19)

MATERIAL & METHODS

Study design

The present study was a retrospective, observational study, cross-sectional study designed to efficiently analyze the prevalence of hypertension and evaluate the effectiveness of its management strategies

Sample size

A total of 50 patients were participated in the study.

Study location

The study was carried out at the Dialysis unit at Nikos Hospital, Dimapur, Nagaland

Study Duration

6 months

Inclusion criteria:

1. Patients aged 18-60 years of age, undergoing Maintenance Hemodialysis for ≥ 6 months
2. Diagnosed with Hypertension and receiving Maintenance Hemodialysis
3. Willing to provide informed consent
4. Both female and male CKD patients

Exclusion criteria:

1. Patients with Acute Kidney Injury
2. Incomplete medical record or non-consent for participation
3. Pregnancy
4. Pediatric Patients.

Data Collection

Data were collected using a structured Proforma, dialysis unit logs, and hospital records

Data Source

1. Gathering and analyzing existing data
2. Pre-existing, documented medical records
3. Interviews with patients and surveys for information about demographics and medical history

Statistical analysis

Collected data was compiled in a Microsoft excel spreadsheet and analyzed using the statistical package for the social sciences (SPSS) version 26.0. the chi-square test was employed to determine the association between categorical variables (such as uncontrolled hypertension and the presence of diabetes). A p-value of less than 0.05 (p,0.05) was considered statistically significant.

Results

A total of 50 patients with CKD undergoing Hemodialysis were included in this study. The mean age of the participants was 52.4 ±10.7 years. the majority of participants,32 (64%) was male and 18 (36%) were female are shown in table 1

Table 1: Gender distribution of the study participants

Gender	Number of patients (n)	Percentage (%)
Male	32	64.0
Female	16	36.0
Total	50	100.0

The largest proportion of patients, 18 (36.0%), belonged to the 51-60 years age group, followed by those aged 41-50 years (30.0%), the prevalence of hypertension among the participants was found to be extremely high. A total of 47 out of 50 patients were hypertensive yielding a prevalence rate 94% are shown in table 2

Table 2: Prevalence of Hypertension among CKD patients undergoing MHD

Blood pressure status	Number of patients	Percentage
Hypertensive	47	94%
Normotensive	3	6.0%
Total	50	100%

The duration of Dialysis among the participants was evaluated. The majority of patients, 22(44.0%), had been on dialysis for 1-3 years, are shown on table 3

TABLE 3: Distribution of patients based on Dialysis vintage

Duration on dialysis (vintage)	Number of Patients	Percentage(%)
<1 year	10	20.0
<1-3 year	22	44.0
3 years	18	36.0

The control of Hypertension among the 47 diagnosed patients was assessed. Only 12 (25.5%) patients achieved the target blood pressure of <140/90 mmHg, while 35(74.5%) patients had In controlled hypertension, are shown in table 4

TABLE 4: Control of hypertension among diagnosed patients (n=47)

BP control status	Number of patients	Percentage
Controlled (<140/90 mmHg)	12	25.5
Uncontrolled (≥140/90)	35	74.5
Total	47	100.0

The association between uncontrolled hypertension and the presence of Diabetes Mellitus was analysed. The results show that 20 out of 22 diabetic patients (90.9%) had uncontrolled BP, indicating a strong and statistically significant association (p=0.03), are shown in table .5

TABLE 5: Association between uncontrolled HTN and Diabetes Mellitus

Presence of Diabetes	Uncontrolled HTN(n=35)	Controlled HTN(n=12)	p-value
Yes(n=22)	20(90.9%)	2 (9.1%)	0.03
No(n=25)	15(60.0%)	10 (40.0%)	

Almost 9 out of every 10 patients were on three or more different blood pressure medicine. The vast majority of hypertensive patients 41(87.2%) were on a regimen of three or more drugs, are shown in table 6

Table 6: Medications used by the patients

Number of blood pressure medicines	Number of patients	Percentage (%)
1-2 drugs	6	12.8
≥3 drugs	41	87.2

The relationship between non-pharmacological management and blood pressure control was evaluated. For patients who adhered to a strict low sodium diet (<2g/day), the blood pressure control rate was 63.2% compared to 0% for non-adherent patients, are shown in table 7

Table 7: Effectiveness of sodium restriction on BP control

Management strategy	Patients who followed	Blood pressure control rate
Strict low-salt diet	19	62.2(12 patients)
Did not follow low salt diet	28	0%(0 patients)

The prevalence of complications in hypertensive patients was assessed. Cardiovascular disease (CVD) was present in 18 (38.3%) patients, and worsened diabetic control was noted in 24(51.1%) patients, shown in table 8

Table 8: Prevalence of complications in Hypertensive Patients (n-47)

Complications	Number of patients	Percentage
Cardiovascular disease (CVD)	18	38.3
Worsened diabetic control	24	51.1

No major complications	5	10.61
Total	47	100.0

Discussion

The prevalence and maintenance of hypertension were evaluated in this study on patients with chronic kidney disease (CKD) undergoing maintenance haemodialysis (MHD). The results highlight a critical and alarming burden of hypertension (94%) within the population, indicating that current management strategies were largely insufficient with a disturbing low rate of successful control (25.5%). Pathophysiological mechanism such as chronic volume overload, renin-angiotensin-aldosterone system (RAAS) activation, and increased sympathetic nervous system activity create a perfect storm for hypertension to develop and persist, furthermore the investigation identified a powerful and statistically significant association (p-0.03) between uncontrolled hypertension and the presence of diabetes mellitus, with 90.9% of diabetic patients failing to achieve blood pressure targets

In terms of managements the study revealed an extreme reliance on antihypertensives with patients requiring three or more, however the most impactful findings were the exceptional effectiveness of a non-pharmacological intervention, adherence to a strict low-sodium diet was associated with a success rate of 63.2%, compared to a 0% success rate among non-adherent patients. This simple low-cost intervention proved more effective for those who followed it than the addition of multiple antihypertensive drugs.it underscores that a strict-low sodium diet is not merely a recommendation but a cornerstone of therapy

Finally, the consequences of uncontrolled hypertension were severe, manifesting as a high prevalence of cardiovascular complications (38.3%) and worsened diabetic control (51.1%) is the direct and inevitable consequence of poor hypertension management. These are not isolated conditions but are interconnected outcomes of sustained high blood pressure, leading to increased morbidity mortality, and reduced quality of life.

Hypertension and the challenges of control the high prevalence of hypertension in the study population 94% was not surprising given that hypertension is nearly universal in CKD patients in stages III-IV (85-95%) due to the pathophysiological features of CKD, including chronic volume overload form sodium retention, hyperactivation of the renin-angiotensin-aldosterone system (RAAS) and increased sympathetic nervous system activity (martin et al., 2013) the findings that 74.55 of these hypertensive patients were not controlled is consistent with the 34.2% rate of target bp achieved in the haemodialysis cohort of Amit Ranjan et al., (2016) , suggesting systemic issues with control, including therapeutic inertia, difficulty achieving truly dry weight, and patient non-adherence, which may be exacerbated by uraemia. The potent effectiveness of sodium restriction supports the foundational principle of dialysis care emphasized by experts like Tedia et al. (2011),

Conclusion

The study reveals a critical gap in hypertension management for CKD patients on hemodialysis while prevalence is near universal (94%), control remains poor (74% uncontrolled). The findings demonstrate that pharmacological polypharmacy alone is insufficient. Most significantly, strict sodium restriction proved dramatically effective, achieving 63.2% control versus 0% in non-adherent patients. These results advocate for paradigm shift toward prioritizing dietary management as foundational therapy. Implementing structured sodium restriction protocols represents the most promising approach to improving outcomes in this high risk population

Reference

1. Coresh J, Selvin E, Stevens LA, Manzi J, Kusek JW, Eggers P, et al. Prevalence of chronic kidney disease in the United States. JAMA. 2007; 298:2038–47.
2. Mills KT, Xu Y, Zhang W, Bundy JD, Chen CS, Kelly TN, et al. A systematic analysis of worldwide population-based data on the global burden of chronic kidney disease in 2010. Kidney Int. 2015; 88:950–7.
3. Martin W F, Armstrong L E, Rodriguez N R. Dietary protein intake and Renal function. Nutrition and Metabolism, 2(1):25, 2005.
4. Fox CS, Matsushita K, Woodward M, et al. Associations of kidney disease measures with mortality and end-stage renal disease in individuals with and without diabetes: a meta-analysis. Lancet. 2012; 380:1662–1673.
5. Levin A, Tonelli M, Bonventre J, et al. Global kidney health 2017 and beyond: a roadmap for closing gaps in care, research, and policy [e-pub ahead of print]. Lancet. http://dx.doi.org/10.1016/S0140-6736(17) 30788-2. Accessed May 1, 2017.
6. Fujii H, Joki N. Mineral metabolism and cardiovascular disease in CKD. Clin Exp Nephrol. 2017;21(supply 1):53–63.
7. Levin NW.Intradialytic Hypertension: 1. Semin dial. 1993; 6:371.
8. Chobanian A V, Bakri's G L, Black H R, Cushman W C, Green L A, Izzo Jr J L, Jones D W, Materson B J, Oparil S, Wright Jr J T, Roccella E J. The seventh report of the joint national committee on prevention, detection, evaluation and treatment 7 2017ppp 20925 © Inventi Journals (P) Ltd Published on Web 29/11/2016, www.inventi.in RESEARCH ARTICLE of high blood pressure: the JNC 7 report. JAMA, 289(19):2560 71, 2003.
9. Elaine Ku, Benjamin J. Lee, Jenny Wei, Matthew R. Weir, Hypertension in CKD: Core Curriculum 2019, American Journal of Kidney Diseases, Volume 74, Issue 1,2019,
10. Gansevoort RT, Correa-Rotter R, Hemmelgarn BR, Jafar TH, Heerspink HJ, Mann JF, et al. chronic kidney disease and cardiovascular risk: epidemiology, mechanisms, and prevention. Lancet.2013;382:339–52
11. Klag MJ, Whelton PK, Randall BL, Neaton JD, Brancati FL, Ford CE, Shulman NB, Stamler J. Blood pressure and end-stage renal disease in men. *N Engl J Med*. 1996; 334:13–18. Doi: 10.1056/NEJM199601043340103

12.Lee H, Kwon SH, Jeon JS, Noh H, Han DC, Kim H. Association between blood pressure and the risk of chronic kidney disease in treatment-naïve hypertensive patients. *Kidney Res Clin Pract*. 2022; 41:31–42. Doi: 10.23876/j.krcp.21.099
13. Sim JJ, Shi J, Kovesdy CP, Kalantar-Zadeh K, Jacobsen SJ. Impact of achieved blood pressures on mortality risk and end-stage renal disease among a large, diverse hypertension population. *J Am Coll Cardiol*. 2014; 64:588–597. Doi: 10.1016/j.jacc.2014.04.065
14. Pugh D, Gallacher PJ, Dhaun N. Management of hypertension in chronic kidney disease. *Drugs*. 2019; 79:365–379. doi: 10.1007/s40265-019-1064-1
15. CY, McCulloch CE, Darbinian J, Go AS, Iribarren C. Elevated blood pressure and risk of end-stage renal disease in subjects without baseline kidney disease. *Arch Intern Med*. 2005; 165:923–928. doi: 10.1001/archinte.165.8.923
16. Tozawa M, Iseki K, Iseki C, Kinjo K, Ikemiya Y, Takishita S. Blood pressure predicts risk of developing end-stage renal disease in men and women. *Hypertension*. 2003; 41:1341–1345. doi: 10.1161/01.HYP.0000069699.92349.8C
.17.Garofalo C, Borrelli S, Pacilio M, Minutolo R, Chiodini P, De Nicola L, Conte G. Hypertension and prehypertension and prediction of development of decreased estimated GFR in the general population: a meta-analysis of cohort studies. *Am J Kidney Dis*. 2016; 67:89–97. doi: 10.1053/j.ajkd.2015.08.027
18.Obermayr RP, Temml C, Knechtelsdorfer M, Gutjahr G, Kletzmayr J, Heiss S, Ponholzer A, Madersbacher S, Oberbauer R, Klauser-Braun R. Predictors of new-onset decline in kidney function in a general middle-european population. *Nephrol Dial Transplant*. 2008; 23:1265–1273. doi: 10.1093/ndt/gfm790
19. Smink PA, Lambers Heerspink HJ, Gansevoort RT, de Jong PE, Hillege HL, Bakker SJ, de Zeeuw D. Albuminuria, estimated GFR, traditional risk factors, and incident cardiovascular disease: the PREVEND (Prevention of Renal and Vascular End stage Disease) study. *Am J Kidney Dis*. 2012; 60:804–811. doi: 10.1053/j.ajkd.2012.06.017
20. Amit Ranjan, Akhil Kolli, M Raghu Bapi Raju et al, Management of hypertension in CKD Patients Undergoing Maintenance Hemodialysis; A prospective cross Sectional. Inventi Rapid: Pharmacy Practice, 2027(1):1-8, 2016
21.Tedla, F. M., Brar, A., Browne, R., Brown, C., Hypertension in Chronic Kidney Disease: Navigating the Evidence, International Journal of Hypertension, 2011, 132405, 9 pages, 2011. https://doi.org/10.4061/2011/132405